



BS 3456 : Part 3 : Section 3.12 : 1979

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Specification for
**Safety of household and similar
electrical appliances**

**Part 3. Complete particular specifications
Section 3.12 Kitchen machines**

Spécification relative à la sécurité des appareils électrodomestiques
Partie 3. Spécifications particulières complètes
Section 3.12 Machines de cuisine

Spezifikation bezüglich der Sicherheit von elektrischen Haushaltsgeräten
Teil 3. Volle einzelne Spezifikationen
Abschnitt 3.12 Küchenmaschinen

British Standards Institution

Contents

	Page
Foreword	1
Cooperating organizations	Back cover
Specification	
1. Scope	2
2. Definitions	2
3. General requirements	6
4. General conditions for the tests	7
5. Rating	8
6. Classification	8
7. Marking	8
8. Protection against electric shock	10
9. Starting of appliances	11
10. Input and current	12
11. Heating	12
12. No requirement	
13. Electrical insulation and leakage current at operating temperature	15
14. Radio and television interference suppression	15
15. Moisture resistance	16
16. Insulation resistance and electric strength	17
17. Overload protection	18
18. Endurance	18
19. Abnormal operation	20
20. Stability and mechanical hazards	21
21. Mechanical strength	22
22. Construction	22
23. Internal wiring	26
24. Components	26
25. Supply connection and external flexible cables and cords	27
26. Terminals for external conductors	31
27. Provision for earthing	33
28. Screws and connections	34
29. Creepage distances, clearances and distances through insulation	35
30. Resistance to heat, fire and tracking	36
31. Resistance to rusting	37
32. Radiation, toxicity and similar hazards	37
Appendices	
A. Electronic circuits	46
B. Measurement of creepage distances and clearances	48
C. Classification of controls in accordance with the requirements of BS 3955 : Part 3 as type 1 or type 2	50

Tables

	Page
1. Diameter of silver wire for fuse test	12
2. Permissible variations in rated input	12
3. Permissible temperature rises	14
4. Insulation resistance	17
5. Test voltages	18
6. Test operating time	19
7. No requirement	
8. Permissible temperature rises under abnormal operation	20
9. Test force for screwed glands	22
10. Size of cable and conduit entries	27
11. No requirement	
12. Test figures for flexible cord pull and torque	30
13. No requirement	
14. Conductor cross-sectional areas for which terminals shall be suitable	31
15. Dimensions of pillar type terminals	33
16. Dimensions of screw type terminals	33
17. Dimensions of stud type terminals	33
18. Axial pull on conductors	33
19. Torque values for screws and nuts	34
20. Creepage distances and clearances	36

Figures

1. Standard test finger	38
2. Test pin	38
3. No requirement	
4. Diagram for leakage current measurement at operating temperature for single-phase connection of class II appliances	39
5. Diagram for leakage current measurement at operating temperature for single-phase connection of appliances other than those of class II	39
6. No requirement	
7. No requirement	
8. No requirement	
9. Vertical rain apparatus	40
10. Splash apparatus	40
11. Spray apparatus	41
12. Impact-test apparatus	41
13. No requirement	
14. Ball-pressure apparatus	42
15. Hot mandrel apparatus	42
16. Arrangement and dimensions of the electrodes for the tracking test	43
17. Apparatus for flexing test specified in 25.10	43
18. Schematic representation of cord anchorages	44
19. Protection for slicers	45

Foreword

This revised specification for electric kitchen machines has been prepared under the direction of the Light Electrical Engineering Standards Committee and is one of the new series of 'stand-alone' specifications which will replace the existing sections of Part 2 of BS 3456.

A need for the revision of the whole of the BS 3456 series has arisen from the harmonization programme of the European Committee for Electrotechnical Standardization (CENELEC). This standard is technically identical with the CENELEC harmonization document (HD) for these appliances, which comprises HD 250 and HD 251 for the general requirements and HD 260 and HD 261 for the particular requirements, except that it is aligned with the agreed revision of HD 250 and HD 251 which will shortly be adopted as HD 251.S2. Any minor changes that may be required as a result of the subsequent revision of HD 260 and 261 to align it with HD 251.S2 will be introduced by amendment action as soon as this revision has been agreed by CENELEC.

CENELEC harmonization documents recognize certain national deviations which cannot, for the moment, be removed. Such United Kingdom departures, in accordance with CENELEC regulations, are denoted in the text by a marginal marking as shown below*. Deviations for other countries may be ascertained by reference to the relevant CENELEC harmonization documents.



For ease of cross-referencing between this standard, the CENELEC HDs and the IEC standards on which the HDs are based, the clause and subclause numbers have been kept in line with those of the second edition of International Electrotechnical Commission Publication 335-1 : 1976, which is the reference document for HD 251.S2.

Where a clause of the IEC standard does not apply to the

appliances covered by this standard the clause number has been retained marked 'No requirement'. Additional subclauses introduced by either the CENELEC HD or by UK deviations from the HDs are numbered with the main clause number followed by .I, .II, etc., for additional clauses for general requirements and .101, .102 etc., for additional clauses for requirements particular to electric kitchen machines.

Appliances complying with the requirements of British Standards in the BS 3456 series of specifications are not necessarily suitable for use in premises to which the Offices, Shops and Railway Premises Act of 1963 and the Factories Act apply.

Compliance with the Electrical Equipment (Safety) Regulations : 1975 will generally be assured if appliances comply with the requirements of BS 3456. For more precise details regarding the relevance of BS 3456 to the regulations, reference should be made to the 'Administrative Guidance on the Electrical Equipment (Safety) Regulations : 1975 and the 'Electrical Equipment (Safety) (Amendment) Regulations 1976', available from HMSO (ISBN 0 11 511831 4).

Certification. The British Electrotechnical Approvals Board (BEAB) uses the series of specifications in BS 3456 as the requirements for granting its certification mark (see the inside back cover for details).

This Standard supersedes BS 3456 : Part 2 : Section 2.28 which will be withdrawn on the date agreed by the CENELEC General Assembly for standards conflicting with HD 260 or HD 261 to be withdrawn. Until this date BEAB will accept for approval appliances complying either with this standard or of BS 3456 : Part 2 : Section 2.28.

* The marginal marking used in the text to indicate national deviations from CENELEC harmonization documents is as follows :



British Standard Specification for

Safety of household and similar electrical appliances

Part 3. Complete particular specifications
Section 3.12 Kitchen machines

1. Scope

1.1 BS 3456: Part 3: Section 3.12 specifies requirements for electric kitchen machines, examples of which are listed below, for household and similar purposes. Multi-purpose kitchen machines are within the scope of this standard.

Examples of such machines are:

- mixers,
- cream whippers,
- coffee grinders and coffee mills,
- egg beaters,
- blenders for liquid,
- blenders for food,
- sieving machines,
- churns,
- ice-cream machines, including those for use in refrigerators,
- citrus fruit squeezers,
- centrifugal juicers for fruit and vegetables,
- machines provided with a worm conveyer, such as mincers, noodle attachments and berry juice extractors,
- slicers for bread, cheese, meat, beans, and the like,
- potato peelers,
- graters and shredding machines for vegetables and fruit,
- cheese graters,
- knife sharpeners,
- can openers,
- knives.

This standard does not take into account the special hazards that exist in nurseries and other places where there are young children or aged or infirm persons without supervision; in such cases additional requirements may be necessary.

This standard does not apply to:

- appliances designed exclusively for industrial and commercial catering purposes;
- appliances intended to be used in locations where special conditions prevail, such as the presence of a corrosive atmosphere (dust, vapour or gas).

Additional requirements may be necessary for food processors, and these are under consideration.

For appliances intended to be used in vehicles or on board ships or aircraft, additional requirements may be necessary.

For appliances intended to be used in tropical countries, special requirements may be necessary.

NOTE Although this standard does not cover commercial catering equipment, it may provide a guide to requirements and tests for such equipment.

1.2 This standard is concerned with safety and takes into account the influence on safety of components that are necessary to achieve a required degree of radio and

television interference suppression.

NOTE. The titles of the standards publications referred to in this standard are listed on the inside back cover.

2. Definitions

Where the terms 'voltage' and 'current' are used, they imply the r.m.s. values unless otherwise specified.

For the purposes of this British Standard the following definitions, with the exception of definitions **2.16** and **2.17**, apply. Definitions **2.16** and **2.17** have been included because, although these classes of appliances are not permitted in the United Kingdom, they are referred to in corresponding international standards.

2.1 rated voltage. The voltage assigned to the appliance by the manufacturer.

2.2 rated voltage range. The voltage range assigned to the appliance by the manufacturer expressed by its lower and upper limits.

2.3 working voltage. The maximum voltage to which the part under consideration can be subjected when the appliance is operating at its rated voltage and under normal conditions of use.

NOTE 1. Normal conditions of use include changes of voltage within the appliance imposed by likely occurrences such as the operation of a circuit breaker or the failure of a lamp.

NOTE 2. When deducing the working voltage, the effect of possible transient voltages on the supply mains is ignored.

2.4 rated input. The input under normal load and at normal operating temperature assigned to the appliance by the manufacturer.

2.5 rated current. The current assigned to the appliance by the manufacturer.

NOTE. If no current is assigned to the appliance, the rated current for the purpose of this standard is determined by calculation from the rated input and the rated voltage and/or by measuring the current when the appliance is operating at rated voltage under normal load and at normal operating temperature.

2.6 rated frequency. The frequency assigned to the appliance by the manufacturer.

2.7 rated frequency range. The frequency range assigned to the appliance by the manufacturer expressed by its lower and upper limits.

2.8 rated capacity. For appliances with a liquid container, the quantity of liquid for which the appliance is designed.

2.9 detachable flexible cable or cord. A flexible cable or cord, for supply or other purposes, intended to be connected to the appliance by means of a suitable appliance coupler.

2.10 power supply cord. A flexible cable or cord, for supply purposes, fixed to, or assembled with, the appliance according to one of the following methods.

type X attachment. A method of attachment such that the flexible cable or cord can easily be replaced, without the aid of special purpose tools, by a flexible cable or cord not requiring any special preparation;

type M attachment. A method of attachment such that the flexible cable or cord can easily be replaced, without the aid of special purpose tools, by a special cable or cord with, for example, a moulded-on cord guard or crimped terminations;

type Y attachment. A method of attachment such that the flexible cable or cord can be replaced only with the aid of special purpose tools normally available only to the manufacturer or his agents.

NOTE. Type M and type Y attachments may be used either with common flexible cables or cords or with special cables or cords.

type Z attachment. A method of attachment such that the flexible cable or cord cannot be replaced without breaking or destroying a part of the appliance.

2.11 No requirement.

2.12 basic insulation. Insulation applied to live parts to provide basic protection against electric shock.

NOTE. Basic insulation does not necessarily include insulation used exclusively for functional purposes.

2.13 supplementary insulation. Independent insulation applied in addition to basic insulation, in order to ensure protection against electric shock in the event of a failure of the basic insulation.

2.14 double insulation. Insulation comprising both basic insulation and supplementary insulation.

2.15 reinforced insulation. A single insulation system applied to live parts, which provides a degree of protection against electric shock equivalent to double insulation under the conditions specified in this standard.

NOTE. The term 'insulation system' does not imply that the insulation must be one homogeneous piece. It may comprise several layers that cannot be tested singly as supplementary or basic insulation.

2.16 class 0 appliance. An appliance in which protection against electric shock relies upon basic insulation; this implies that there are no means for the connection of accessible conductive parts, if any, to the protective (earthing) conductor in the fixed wiring of the installation, reliance in the event of a failure of the basic insulation being placed upon the environment.

NOTE 1. Class 0 appliances have either an enclosure of insulating material which may form a part or the whole of the basic insulation, or a metal enclosure which is separated from live parts by an appropriate insulation. If an appliance with an enclosure of insulating material has provision for earthing internal parts, it is considered to be of class I or class OI construction.

NOTE 2. Class 0 appliances may have parts with double insulation or reinforced insulation, or parts operating at safety extra-low voltage.

2.17 class OI appliance. An appliance having at least basic insulation throughout and provided with an earthing terminal, but with a power supply cord without an earthing conductor and a plug without an earthing contact and which cannot be introduced into a socket-outlet with an earthing contact.

NOTE. Class OI appliances may have parts with double insulation or reinforced insulation, or parts operating at safety extra-low voltage.

2.18 class I appliance. An appliance in which protection against electric shock does not rely on basic insulation only, but which includes an additional safety precaution in such a way that means are provided for the connection of accessible conductive parts to the protective (earthing) conductor in the fixed wiring of the installation so that

accessible conductive parts cannot become live in the event of a failure of the basic insulation.

NOTE 1. Class I appliances may have parts with double insulation, or parts operating at safety extra-low voltage.

NOTE 2. For appliances intended for use with a flexible cord or cable, this provision includes a protective (earthing) conductor as part of the flexible cord or cable.

2.19 class II appliance. An appliance in which protection against electric shock does not rely on basic insulation only, but in which additional safety precautions, such as double insulation or reinforced insulation, are provided, there being no provision for protective earthing or reliance upon installation conditions.

Such an appliance may be of one of the following types:

- (a) an appliance having a durable and substantially continuous enclosure of insulating material that envelops all metal parts, with the exception of small parts, such as nameplates, screws and rivets, which are isolated from live parts by insulation at least equivalent to reinforced insulation; such an appliance is called an 'insulation-encased class II appliance';
- (b) an appliance having a substantially continuous metal enclosure, in which double insulation is used throughout, except for those parts where reinforced insulation is used, because the application of double insulation is manifestly impracticable; such an appliance is called a 'metal-encased class II appliance';
- (c) an appliance which is a combination of the types (a) and (b).

NOTE 1. The enclosure of an insulation-encased class II appliance may form a part or the whole of the supplementary insulation or of the reinforced insulation.

NOTE 2. If an appliance with double insulation and/or reinforced insulation throughout has an earthing terminal or earthing contact, it is considered to be of class I or class OI construction. Class II appliances may be provided with means for maintaining the continuity of protective circuits, provided that such means are within the appliance and are insulated from accessible conductive parts by double insulation or reinforced insulation.

NOTE 3. Class II appliances may have parts operating at safety extra-low voltage.

2.20 class III appliance. An appliance in which protection against electric shock relies on supply at safety extra-low voltage and in which voltages higher than these are not generated.

NOTE. Appliances intended to be operated at safety extra-low voltage and having internal circuits that operate at a voltage other than safety extra-low voltage are not included in the classification and are subject to additional requirements.

2.21 extra-low voltage. A voltage supplied from a source within the appliance and, when the appliance is operated at its rated voltage, not exceeding 42 V between conductors; and between conductors and earth, the extra-low voltage circuit being separated from other circuits by basic insulation only.

2.22 safety extra-low voltage. A nominal voltage not exceeding 42 V between conductors and between conductors and earth, the no-load voltage not exceeding 50 V.

NOTE 1. When safety extra-low voltage is obtained from the supply mains, it is essential that it be through a safety isolating transformer or a converter with separate windings.

NOTE 2. The voltage limits specified are based on the assumption that the safety isolating transformer is operated at its rated supply voltage.

2.23 safety isolating transformer. A transformer the input winding of which is electrically separated from the output windings by an insulation at least equivalent to

double insulation or reinforced insulation, and which is designed to supply a distribution circuit, an appliance or other equipment at safety extra-low voltage.

NOTE. Transformers complying with the requirements of BS 3535 without provision for earthing and with the appropriate output voltages are considered to be safety isolating transformers for the purposes of this specification.

2.24 portable appliance. Either an appliance that is moved while in operation or an appliance that can easily be moved from one place to another while connected to the supply.

2.25 hand-held appliance. A portable appliance intended to be held in the hand during normal use, the motor, if any, forming an integral part of the appliance.

2.26 stationary appliance. Either a fixed appliance or an appliance having a mass exceeding 18 kg and not provided with a carrying handle.

2.27 fixed appliance. An appliance that is fastened to a support or otherwise secured in a specific situation.

2.28 appliance for building-in. An appliance intended to be installed in a cupboard fitment or sink unit, in a prepared recess in a wall or in a similar situation.

NOTE. In general, appliances for building-in do not have an enclosure on all sides because, for some of the sides, protection against electric shock is obtained after installation.

2.29 No requirement.

2.30 normal load. The load obtained when the appliance is operated under the conditions specified below or, for appliances marked with rated input, the load necessary to attain rated input at rated voltage, whichever is the higher.

The load necessary to attain rated input at rated voltage is not considered to be the higher if the input measured during the test specified in clause 10 differs from the rated input by not more than the deviations shown in the following table.

Rated Input	Deviation
W	
Up to and including 33.3	-10 W
Over 33.3 up to and including 150	-30 %
Over 150 up to and including 300	-45 W
Over 300	-15 %

The load necessary to attain rated input is obtained by applying a constant torque when the appliance is placed in its normal position of use.

Appliances provided with a timer are operated for a period having a duration determined by the highest setting of the timer.

Unless other specified, speed controls are set to the position indicated in the instruction sheet or, in the absence of such instructions, to the position giving the most unfavourable result.

Conditions of operation for individual appliances. The following conditions shall be observed.

(a) Mixers

Mixers shall be operated for 30 s at the lowest speed setting in a bowl filled with a mixture of flour and water. The mixers shall then be operated at the speed setting indicated for dough-mixing in the instruction sheet or, in the absence of instructions, at the most unfavourable speed setting, for a period of:

- 5 min for hand-held mixers;
- 10 min for other mixers.

The flour to be used for the mixture is prepared from European grown wheat having a protein content of

10 ± 0.5% based on a negligible water content of the flour; the flour should be free from chemical additions.

Before mixing is started the bowl shall be filled with a quantity of flour equal to 65 % of the quantity necessary to fill the bowl to the maximum level.

The quantity of water to be added to the flour shall be such that it gives a consistency of 500 Brabender units, determined by means of a farinograph, at a temperature of 29 ± 1 °C. When starting the test, the temperature of the flour shall be 25 ± 2 °C and that of the water 25 ± 1 °C.

(1) *For hand-held mixers*, the beaters shall be moved in the bowl so as to form a figure-of-eight such that the extreme ends of the beaters touch the wall slightly at diametrically opposite points. The beaters shall be in slight contact with the bottom of the bowl throughout their movement. The rate of movement shall be such that 10 to 15 figures-of-eight per minute are performed.

(2) *For mixers delivered without a bowl*, a test bowl shall be used which has an inner height of approximately 130 mm and an inner diameter of approximately 170 mm at the top, tapering down to approximately 150 mm at the bottom. Its inner surface shall be smooth and the inner wall and bottom shall blend smoothly.

(3) *For mixers delivered with kneaders* designed to mix a yeast-dough, the quantity of water to be added to the flour shall be 1.2 times that necessary to give a consistency of 500 Brabender units.

(4) *For mixers delivered with beaters* designed to mix cake batter, to mash potatoes, etc., the quantity of water to be added to the flour shall be 1.7 times that necessary to give a consistency of 500 Brabender units.

NOTE 1. The values specified for the quantity of flour are based on an initial water content of 13 % to 14 %.

NOTE 2. Before mixing is started the bowl should be charged first with the quantity of flour specified; then the quantity of water specified should be added.

NOTE 3. Hand-held mixers provided with kneaders designed to mix yeast dough and delivered with a stand are operated for 10 min; if the stand is such that it unloads the mixer automatically when the dough is ready, the unloading mechanism should not be locked.

NOTE 4. In case of doubt, the flour used should not be less than two weeks or more than four months old, and should be stored in plastic bags, the quantity of air in the bags being as small as possible.

(b) Cream whippers and egg beaters

Cream whippers and egg beaters shall be operated in water for 10 min at the highest speed setting with 80 % of the active part of the accessories immersed in the water.

(c) Blenders for liquid

Blenders for liquid shall be operated with the bowl filled with water either to two-thirds of its capacity or up to the upper level, if indicated.

(1) *For blenders delivered without a bowl*, a cylindrical test bowl having a capacity of approximately 1 l shall be used, its inner diameter being approximately 110 mm.

(2) *For hand-held blenders and for table-type blenders that have to be kept switched on by hand*, the sequence shall comprise five periods of operation of 1 min with a rest of 1 min between each period.

(3) *For other table-type blenders*, the sequence shall comprise ten periods of operation for 3 min with a rest of 1 min between each period. Speed controls shall be set to the position giving the most unfavourable result.

(d) Blenders for food

Blenders for food shall be operated with the bowl filled with a mixture of two parts by mass of carrots, cut in pieces with dimensions not exceeding 15 mm, in three parts of water. The bowl shall be filled with the mixture to two-thirds of its capacity or up to the upper level, if indicated.

NOTE 1. The mixture of carrots and water is prepared 24 h before the test is started.

NOTE 2. Care should be taken to ensure that accidental stalling does not occur.

(1) *For blenders delivered without a bowl*, a cylindrical test bowl having a capacity of 1 l shall be used, its inner diameter being approximately 110 mm.

(2) *For hand-held blenders, and for table-type blenders that have to be kept switched on by hand*, the sequence shall comprise five periods of operation of 1 min with a rest period of 1 min between each.

(3) *For other table-type blenders*, the sequence comprises ten periods of operation of 3 min, with a rest period of 1 min between each. During each rest period, the mixture shall be replaced by a fresh one.

(4) *A multi-speed blender* shall be tested at its highest and lowest speed. The load for the low speed shall consist of water alone and the load for high speed shall be the carrot mixture.

(e) Sieving machines

Sieving machines shall be operated idling for 30 min.

(f) Churns

Churns shall be operated for 30 min, the container being filled with a mixture of eight parts by volume of heavy cream and one part of buttermilk, to the maximum capacity which it will accommodate without spillage during operation.

(g) Ice-cream machines (other than those for use in refrigerators)

Ice-cream machines of this type shall be operated for 30 min, the container being filled with a mixture of 0.5 litre of water, 250 g of sugar, 50 g of lemon juice, and 50 g of beaten white of egg.

NOTE. Instead of the mixture specified, the mixture recommended by the manufacturer or any other suitable mixture may be used.

The outer cooling container shall be filled with ice cubes and salt in accordance with the manufacturer's instructions, 200 g of salt being added for each kilogram of ice.

(h) Ice-cream machines for use in refrigerators

Ice-cream machines of this type shall be operated idling for 5 min and then stalled for 25 min in an ambient temperature of -4°C .

NOTE. Care should be taken to ensure that the machine is not in contact with surfaces having a temperature different from that specified. The machine under test should be placed on two bars of insulating material with a thickness of approximately 1 cm.

(i) Citrus fruit squeezers

Citrus fruit squeezers shall be operated for ten periods of 15 s, during each of which two orange halves, or grapefruit halves are pressed against the running reamer with a force of 20 N, with an idling period of 15 s between each.

NOTE. If idling is prevented by an automatic switching-off device, rests of 15 s are introduced between each period.

(j) Centrifugal juicers for fruit and vegetables

Centrifugal juicers shall be operated as follows. Appliances for intermittent operation for ten periods

during each of which the appliance is supplied with 0.5 kg of carrots for 2 min, unless otherwise indicated in the manufacturer's instruction sheet, with a rest period of 2 min between each.

Appliances for continuous operation shall be operated for 30 min, the appliance being supplied gradually with 5 kg of carrots.

The pusher, if any, shall be pressed with a force of 5 N against the carrots.

NOTE. The carrots shall be soaked in water for approximately 24 h before the start of the test.

(k) Mincers, noodle attachments and berry extractors

Mincers, noodle attachments and berry extractors shall be operated for 15 min with the load necessary to attain the input determined during the test specified in clause 10, table 2, the load being applied by means of a brake.

(l) Slicers

Slicers for bread, cheese, meat, beans and the like shall be operated idling for:

(a) 10 min for slicers having a rated operating time less than 10 min;

(b) 30 min for other slicers.

(m) Potato peelers

Potato peelers shall be operated in accordance with the sequence described below, the container being filled with water and 5 kg of potatoes approximately round in shape, and having a size corresponding to 12 to 15 potatoes per kilogram.

(1) *Potato peelers for intermittent operation* shall be operated for the number of periods sufficient to peel the potatoes adequately, with a rest of 2 min between each period. If a timer is provided, this shall be reset continuously as many times as are necessary to achieve adequate peeling.

(2) *Potato peelers for continuous operation* shall be operated for one period sufficient to peel the potatoes adequately, the potatoes being supplied gradually.

NOTE. When checking the degree of peeling, eyes are ignored.

(n) Graters and shredding machines for vegetables and fruit

Graters and shredding machines shall be operated for five periods, each period being sufficiently long to shred 0.5 kg of carrots, cut into suitable pieces, with a rest of 2 min between each period.

The pusher, if any, shall be pressed with a force of 5 N against the carrots.

NOTE. The carrots should be soaked in water for 24 h before the start of the test.

(o) Cheese graters

Cheese graters shall be operated for a time long enough to grate 0.5 kg of Parmesan cheese, the cheese being supplied gradually.

(p) Knife sharpeners

Knife sharpeners shall be operated idling for 10 min.

(q) Can openers

Can openers shall be operated for five periods during each of which a can of tinned steel having a diameter of approximately 100 mm is opened, with a rest period of 30 s between each period.

(r) Knives

Knives shall be operated for 15 min, during which normal cutting operations are simulated at a rate of ten cuts per minute. The blade is loaded by pressing the



cutting edge against a block of soft wood having a cross-sectional area of approximately 50 mm × 100 mm, and is then unloaded by raising the knife. During the cutting operations the force is gradually applied to the knife until the input measured during the test specified in 10.1 is attained.

(s) Coffee grinders and coffee millers

Coffee grinders and coffee millers shall be operated with the grain size control adjusted to the finest setting.

(1) Appliances provided with a separate container in which coffee grains are collected, shall be operated twice, with a rest period of 1 min between each period of operation. For each operation, the appliance shall be kept switched on for the time necessary to fill the separate container completely to grind 125 g of coffee beans or to empty the hopper, whichever is the shorter. Before each period of operation the hopper shall be completely filled with coffee beans.

(2) Other appliances shall be operated three times, with a rest period of 1 min between each period of operation. For each period of operation, the appliance shall be kept switched on for the time necessary to grind the required quantity of coffee beans for the rated operating time, or for 30 s, whichever is the longer. Before each period of operation the container shall be filled with the required quantity of coffee beans.

(3) Appliances provided with a timer shall be operated for a period having a duration determined by the highest setting of the timer.

During operation the appliance shall be slightly shaken or tapped.

NOTE. In case of doubt, the coffee beans are kept for 24 h at a temperature of 30 ± 2 °C in air with a relative humidity of 60 ± 2 % before starting the relevant test. After conditioning, the beans should have a density of 0.65 ± 0.03 g/cm³.

(t) Appliances other than those mentioned shall be operated for:

- 5 min for appliances for short time or intermittent operation;
- 30 min for appliances for continuous operation, unless a longer period is marked on the appliance, in which case the longer period applies.

The appliance shall be operated with the load necessary to attain rated input at rated voltage or with the load indicated in the instruction sheet, whichever is the higher.

2.31 rated operating time. The operating time assigned to the appliance by the manufacturer.

2.32 continuous operation. Operation under normal load for an unlimited period.

2.33 short-time operation. Operation under normal load for a specified period, starting from cold, the intervals between each period of operation being sufficient to allow the appliance to cool down approximately to room temperature.

2.34 intermittent operation. Operation in a series of specified identical cycles, each cycle being composed of a period of operation under normal load, followed by a rest period with the appliance running idle or switched off.

2.35 non-detachable part. A part that can be removed only with the aid of a tool.

2.36 detachable part. A part that can be removed without the aid of a tool.

2.37 No requirement.

2.38 No requirement.

2.39 thermal cut-out. A device which, during abnormal operation, limits the temperature of an appliance, or of parts of it, by automatically opening the circuit or by reducing the current, and which is so constructed that its setting cannot be altered by the user.

2.40 self-resetting thermal cut-out. A thermal cut-out that automatically restores the current after the relevant part of the appliance has cooled down sufficiently.

2.41 non-self-resetting thermal cut-out. A thermal cut-out that requires resetting by hand, or replacement of a part, in order to restore the current.

2.42 tool. A screwdriver, a coin or any other object that may be used to operate a screw or similar fixing means.

2.43 creepage distance. The shortest path between two conductive parts, or between a conductive part and the bounding surface of the appliance, measured along the surface of the insulating material.

2.44 clearance. The shortest distance between two conductive parts, or between a conductive part and the bounding surface of the appliance, measured through air.

NOTE. The bounding surface of the appliance is the outer surface of the enclosure, considered as though metal foil were pressed into contact with accessible surfaces of insulating material.

2.45 all-pole disconnection. For single-phase a.c. appliances and for d.c. appliances disconnection by a single switching action.

NOTE. The protective earthing conductor is not considered to be a supply conductor.

2.46 No requirement.

2.47 accessible part or accessible surface. A part or surface that can be touched by means of test finger I specified in BS 3042 (see figure 1).

2.48 body. All accessible metal parts, shafts of handles, knobs, grips and the like and metal foil in contact with all accessible surfaces of insulating material but excluding inaccessible metal parts.

2.101 food mixer. A motor-powered mixing device primarily intended for mixing food ingredients together. A food mixer is considered to be an appliance for short-time or intermittent operation.

2.102 hand mixer. A food mixer designed to be held in the hand during normal use.

2.103 stand supported mixer. A food mixer supplied with a stand designed to support the mixer and mixing bowl in position for the beaters to act upon the ingredients in the bowl. The mixer may be removable from the stand.

2.104 coffee grinder. An appliance or attachment designed to grind coffee-beans by means of discs, cylinders, cones, or similar devices.

2.105 coffee mill. An appliance or attachment designed to break up coffee-beans by means of cutting blades rotating at high speed.

3. General requirements

3.1 Appliances shall be so designed and constructed that in normal use, they function safely so as to cause no danger to persons or surroundings, even in the event of such careless use as may occur in normal service.

TEST. In general, compliance shall be checked by carrying out all the relevant tests specified.

3.1 Additionally, where the standard is used for the purposes of granting nationally recognized certification marks, designs or constructions to which the tests specified do not fully apply but which give an equivalent degree of safety and durability of safety, may be regarded as complying with the requirements of this standard, subject to the findings of a special investigation by the authority granting the certification mark and pending the issue of an amendment or extension to this standard.

4. General conditions for the tests

4.1 Tests carried out according to this standard are type tests.

4.2 Unless otherwise specified, the tests shall be carried out on a single sample as delivered, which shall withstand all the relevant tests.

NOTE 1. If it is evident from the design of the appliance that a particular test is not applicable, this test is not carried out.

NOTE 2. If the appliance is designed for different supply voltages, for both a.c. and d.c., for different speeds, etc., more than one sample may be required.

NOTE 3. If it is necessary to dismantle a class II appliance for the relevant tests, one additional sample is required.

NOTE 4. The testing of components may necessitate the submission of additional samples of these components. When the submission of such samples is necessary, they should be submitted together with the appliance.

4.3 Unless otherwise specified, the tests shall be carried out in the order of the clauses of this specification.

NOTE. Before testing is started, the appliance is operated at rated voltage in order to verify that it is in working order.

4.4 The tests shall be carried out with the appliance, or any movable part of it, placed in the most unfavourable position that may occur in normal use.

4.5 If the test results are influenced by the temperature of the ambient air, the room temperature shall be, in general, maintained at 20 ± 5 °C. If, however, the temperature attained by any part is limited by a temperature-sensitive device, or is influenced by the temperature at which a change of state occurs, for example, the temperature of boiling water, the room temperature is, in case of doubt, maintained at 23 ± 2 °C.

4.6 Appliances for a.c. only shall be tested with a.c., at rated frequency, if marked; those for d.c. only shall be tested with d.c. and those for a.c./d.c. shall be tested at the more unfavourable supply.

Appliances for a.c. that are not marked with a rated frequency shall be tested at 50 Hz.

Appliances for a.c. that are marked with a rated frequency range of 50 Hz to 60 Hz shall be tested at 50 Hz or 60 Hz, whichever is the more unfavourable.

Appliances marked with a rated frequency range other than 50 Hz to 60 Hz shall be tested at the most unfavourable frequency within the range.

Appliances designed for more than one rated voltage shall be tested at the most unfavourable voltage.

Unless otherwise specified, appliances designed for one or more rated voltage ranges shall be tested at the most unfavourable voltage within the relevant range.

When it is specified, for appliances marked with a rated voltage range, that the supply voltage is equal to the rated voltage multiplied by a factor, the supply voltage shall be equal to:

the upper limit of the rated voltage range multiplied by this factor, if greater than 1;

the lower limit of the rated voltage range multiplied by this factor, if smaller than 1.

NOTE. Where reference is made to maximum or minimum rated input, the rated input related to the upper limit or lower limit respectively of the rated voltage range is meant.

When testing appliances for d.c. only, the possible influence of polarity on the operation of the appliance shall be taken into consideration.

NOTE. If the appliance is designed for more than one rated voltage or rated voltage range, it may be necessary to carry out some of the tests at the minimum, the mean and the maximum values of the rated voltage or the rated voltage range in order to establish the most unfavourable voltage.

4.7 Appliances for which alternative accessories are available shall be tested with those accessories that give the most unfavourable results, provided that the accessories used are within the appliance manufacturer's specification.

4.8 No requirement.

4.9 Appliances provided with a regulating device or a similar control shall be tested with these controls adjusted to their most unfavourable setting, if the setting can be altered by the user.

NOTE 1. If the adjusting means of the control is accessible without the aid of a tool, this subclause applies whether the setting can be altered by hand or with the aid of a tool. If the adjusting means is not accessible without the aid of a tool, this subclause applies only if the setting can be altered by hand.

NOTE 2. Adequate sealing is regarded as preventing alteration of the setting by the user.

4.10 Where appropriate, appliances for building-in shall be installed in accordance with the manufacturer's instructions for installation, as far as these are in accordance with normal installation conditions.

4.11 Unless otherwise specified, appliances intended to be supplied by means of a flexible cable or cord shall be tested with the appropriate flexible cable or cord connected to the appliance.

4.12 No requirement.

4.13 Appliances shall be loaded according to the specified conditions of normal use, irrespective of any marking of short time or intermittent operation unless it is evident from the design of an appliance that these conditions will not occur in normal use.

4.14 Class III appliances shall be tested together with their supply transformers if these are sold with the appliances.

4.15 For the purposes of 8.6, 8.7, 16.4, 25.11 and 27.1, parts separated from live parts by double insulation or reinforced insulation shall be regarded as not being likely to become live in the event of an insulation fault; connection of accessible metal parts to an earthing terminal or earthing contact does not remove the necessity for carrying out the relevant tests.

4.16 If class I appliances have accessible metal parts that are not connected to an earthing terminal or earthing contact and that are not separated from live parts by an intermediate metal part which is connected to an earthing terminal or earthing contact, such parts shall be checked for compliance with the appropriate requirements specified for class II appliances.

4.17 If class I or class II appliances have parts operating at safety extra-low voltage, such parts shall be checked for compliance with the appropriate requirements specified for class III appliances.

4.18 For testing appliances incorporating electronic circuits, see appendix A.

BS 3456 : Part 3 : Section 3.12 : 1979

4.101 Unless the appliance is designed to be fixed in normal use, it shall be tested as a portable appliance.

Hand-held appliances shall be subjected to the additional tests specified for them.

4.102 If an appliance is loaded by means of a brake, care shall be taken to minimize imbalance during test.

5. Rating

5.1 The maximum rated voltage is 250 V.

TEST. Compliance shall be checked by inspection of the marking.

The requirements of this standard are based on the assumption that, in normal use, the voltage between the supply lines and earth does not exceed 254 V.

5.1 Single-phase appliances intended for direct connection to the UK mains supply shall have a rated voltage that covers use at 240 V and a rated frequency that covers use at 50 Hz.

TEST. Compliance shall be checked by inspection of the marking.

6. Classification

The appliances covered by this standard shall be classified:

- (a) according to protection against electric shock:
 - class I appliances;
 - class II appliances;
 - class III appliances.

NOTE 1. The class numbers are not intended to reflect the safety level of the appliances, but only the means by which the safety is obtained.

NOTE 2. If class III appliances are sold with a separate safety isolating transformer for their supply from the mains, their classification is not altered.

- (b) according to degree of protection against moisture:

- ordinary appliances;
- drip-proof appliances;
- splash-proof appliances;
- watertight appliances.

7. Marking

7.1 Appliances shall be marked with:

- (a) rated voltage(s) or rated voltage range(s), in volts; optional for appliances with detachable heating elements only;
- (b) symbol for nature of supply, if applicable;
- (c) rated frequency or rated frequency range, in hertz, unless the appliance is designed for d.c. only or for a.c. of both 50 Hz and 60 Hz;
- (d) rated input in watts or kilowatts, if greater than 25 W;
- (e) rated current of the appropriate fuse-link in amperes for motor-operated appliances where the inrush current requires a fuse of a current rating higher than that appropriate to the marked rating (see 9.2);

If the rated current of the appropriate fuse-link is marked and if the fuse or fuse-link is of the time-lag type, information about the time/current characteristic rating shall be included in the relevant marking;

(f) manufacturer's or responsible vendor's name, trade mark or identification mark;

(g) manufacturer's model or type reference;

(h) rated operating time, or rated operating time and rated resting time, in hours, minutes or seconds, if less than specified for normal load;

(i) symbol for class II construction, for class II appliances only;

(j) symbol for degree of protection against moisture, if applicable;

(k) the speed setting corresponding to normal load.

If the appliance is delivered with alternative accessories, the marking of rated input, rated operating time and speed setting is optional, but if the appliance is marked, the rated input shall correspond to the most unfavourable accessory within the appliance manufacturer's specification.

In addition, motors with windings insulated with class B, class F or class H material only shall be marked with the class designation of their winding insulation.

NOTE 1. The rated input or rated current is the total maximum input or current of the circuits that can be in operation simultaneously.

NOTE 2. If an appliance has alternative components that can be selected by a control device, the rated input is that corresponding to the highest loading possible.

NOTE 3. If the motor of an appliance is marked separately, it is essential that the marking of the appliance and that of the motor be such that there can be no doubt with regard to the rating and manufacturer of the appliance itself.

NOTE 4. Additional markings are allowed, provided they do not give rise to misunderstanding.

7.2 Appliances for short-time operation or intermittent operation shall be marked with rated operating time or rated operating time and rated resting time respectively, unless the operating time is either limited by the construction of the appliance or it corresponds to the condition of normal load described in 2.30.

The marking of short-time operation or intermittent operation shall correspond to normal use.

The marking of intermittent operation shall be such that the rated operating time precedes the rated resting time, both markings being separated by an oblique stroke.

7.3 No requirement.

7.4 If the appliance can be adjusted to suit different rated voltages or different rated inputs, the voltage or input to which the appliance is adjusted shall be easily and clearly discernible.

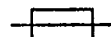
NOTE. For appliances for which frequent changes in voltage setting are not required, this requirement is considered to be complied with if the rated voltage or the rated input to which the appliance is adjusted can be determined from a wiring diagram fixed to the appliance; the wiring diagram may be on the inside of a cover which has to be removed to connect the supply conductors. This diagram may be on a card which is riveted to the cover, or on a paper or similar label secured to the cover by an adhesive, but it must not be on a label loosely attached to the appliance.

7.5 For appliances marked with more than one rated voltage or rated voltage range, the rated input for each of these voltages or ranges shall be marked, if greater than 25 W.

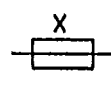
The upper and lower limits of the rated input shall be marked on the appliance so that the relation between input and voltage appears distinctly unless the difference between the limits of a rated voltage range does not exceed 10 % of the mean value of the range. The marking for rated input may be related to the mean value of the range.

7.6 When symbols are used, they shall be as follows:

V	volts
A	amperes
Hz	hertz
W	watts
kW	kilowatts
μ F	microfarads
l	litres
kg	kilograms
h	hours
min	minutes
s	seconds
~	alternating current
—	direct current

 A rated current of the appropriate fuse-link

 time-lag D-type fuse-link

 time-lag miniature fuse-link where X is the symbol for time/current characteristic as given in BS 4265

 Class II construction

 drip-proof construction (one drop)

 splash-proof construction (one drop in a triangle)

 watertight construction (two drops)

The symbol for nature of supply shall be placed next to the marking for rated voltage.

The dimensions of the symbol for class II construction shall be such that the length of the sides of the outer square is about twice the length of the sides of the inner square. The length of the sides of the outer square shall be not less than 5 mm, unless the largest dimension of the appliance does not exceed 150 mm, in which case the dimensions of the symbol may be reduced, but the length of the sides of the outer square shall be not less than 30 mm.

The symbol for class II construction shall be so placed that it will be obvious that it is a part of the technical information and is unlikely to be confused with any other marking.

7.7 For class I appliances, the line terminal shall be indicated by the letter L.

Terminals intended exclusively for the neutral conductor shall be indicated by the letter N.

Earthing terminals shall be indicated by the symbol .

These indications shall not be placed on screws, removable washers or other parts that might be removed when conductors are being connected.

7.8 No requirement.

7.9 Unless it is obviously unnecessary, switches, the operation of which might cause a hazard, shall be so marked or placed as to indicate clearly which part of the appliance they control.

Indications used for this purpose shall, wherever practicable, be comprehensible without a knowledge of languages, national standards, etc.

7.10 The different positions of regulating devices, and the different positions of switches on stationary appliances shall be indicated by figures, letters or other visual means. The 'off' position shall not be indicated by words only.

If figures are used for indicating the different positions, the 'off' position shall be indicated by the figure 0 and the position for a greater output, input, speed, cooling effect, etc., shall be indicated by a higher figure.

The figure 0 shall not be used for any other indication.

7.11 Regulating devices and the like, intended to be adjusted during installation or in normal use, shall be provided with an indication for the direction of adjustment to increase or to decrease the value of the characteristic being adjusted.

NOTE. An indication of + and - is considered to be sufficient.

7.12 If it is necessary to take special precautions when installing or using the appliance, details of these shall be given in an instruction sheet that accompanies the appliance. If a stationary appliance is not provided with a non-detachable flexible cable or cord intended to be connected to a plug, or with other means for disconnection from the supply having a contact separation of at least 3 mm in all poles, the instruction sheet shall state that such means for disconnection must be incorporated in the fixed wiring.

Accessories sold separately shall be accompanied by an instruction sheet giving the necessary explanation unless this information is included in the instruction for the appliance.

If the supply wires of an appliance can come into contact with parts of a terminal block or compartment for fixed wiring and these parts have, under conditions of normal use, a temperature such that the insulation of the wire is subjected to a temperature rise exceeding that specified in table 3, the instruction sheet shall also state that the appliance must be connected by means of wires having appropriate T-marking or T-rating.

NOTE. Special precautions may be necessary, for example, for appliances for building-in.

In order to ensure that, after building-in, the conditions necessary to comply with the requirements of this standard are achieved, the instruction sheet for appliances for building-in should give clear information with regard to the following:

- dimensions of the space to be provided for the appliance;
- dimensions and position of the means for supporting and fixing the appliance within this space;
- minimum clearances between the various parts of the appliance and the surrounding parts of the fitment;
- minimum dimensions of ventilating openings and their correct arrangement;
- connection of the appliance to the supply and the interconnection of separate components, if any.

For appliances with type Z attachment, the instruction sheet shall contain the substance of the following information:

'The supply cord of this appliance cannot be replaced; if the cord is damaged, the appliance should be discarded.'

7.13 Instruction sheets and other texts required by this standard shall be written in the official language(s) of the country in which the appliance is to be sold. For appliances for sale in the United Kingdom instructions shall be in English.

Where symbols are used, they shall be those indicated in

this standard, although additional symbols are permitted if they do not give rise to misunderstanding.

TEST. Compliance with the requirements of 7.1 and 7.2, 7.4 to 7.7 and 7.9 to 7.13 shall be checked by inspection.

7.14 Marking required by this standard shall be easily legible and durable.

Marking specified in 7.1, 7.2, 7.4 and 7.5 shall be on a main part of the appliance.

The marking of fixed appliances shall be clearly discernible from the outside after the appliance has been fixed as in normal use but, if necessary, after removal of a cover.

The marking of other appliances shall be clearly discernible from the outside, if necessary after removal of a cover; for portable appliances, the removal of this cover shall not require the use of a tool.

For stationary appliances, the marking shall be beneath a cover only if it is near to the terminals for external conductors.

Marking on, and indications for, switches, thermal cut-outs and other control devices shall be placed in the vicinity of these components; they shall not be placed on removable parts if these parts can be replaced in such a way that the marking is misleading.

TEST. Compliance shall be checked by inspection and by rubbing the marking by hand for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked with petroleum spirit.

After all the tests specified in this standard, the marking shall be easily legible, it shall not be easily possible to remove marking plates and they shall show no curling.

NOTE 1. A revision of the test for checking the durability of the marking is under consideration.

NOTE 2. In considering the durability of the marking, the effect of normal use is taken into account. Thus, for example, marking by means of paint or enamel other than vitreous enamel on containers that are likely to be cleaned frequently is not considered to be durable.

7.1 A label shall be attached to the flexible cord of all class I appliances fitted with a flexible cable or cord having cores coloured green-and-yellow, blue and brown. This label shall state the following:

'IMPORTANT

The wires in this mains lead are coloured in accordance with the following code.

Green-and-yellow: Earth

Blue: Neutral

Brown: Live'

In addition, the user instructions and label shall include the substance of the following:

'As the colours of the wires in the mains lead of this appliance may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows.

The wire which is coloured green-and-yellow must be connected to the terminal in the plug which is marked with the letter E or by the earth symbol  or coloured green or green-and-yellow.

The wire which is coloured blue must be connected to the terminal which is marked with the letter N or coloured black.

The wire which is coloured brown must be connected to the terminal which is marked with the letter L or coloured red.'

For class II appliances fitted with a flexible cord, instructions shall be given by the manufacturer for the correct connection of the plug. These instructions shall make it clear that neither core is to be connected to the earth terminal of a three-pin plug.

TEST. Compliance shall be checked by inspection.

7. II For portable class I appliances the following warning notice shall be given on a label attached to the end of the flexible cord.

'WARNING - THIS APPLIANCE MUST BE EARTHED'

For all class I appliances the warning shall be included in the user instructions.

NOTE. The label specified in 7. I may be used for this purpose: a separate label is not required.

TEST. Compliance shall be checked by inspection.

7. III No requirement.

NOTE. For appliances intended for export, alternative labelling to that specified in 7. I and 7. II may be required.

8. Protection against electric shock

8.1 Appliances shall be so constructed and enclosed that there is adequate protection against accidental contact with live parts and, for class II appliances, with metal parts separated from live parts by basic insulation only. This requirement applies for all positions of the appliance when it is wired and operated as in normal use, even after opening of lids and doors and removal of detachable parts, except for lamps located behind a detachable cover, provided that the appliance can be isolated from the supply by means of a plug or an all-pole switch, the 'off' position of which is clearly indicated. During the insertion or removal of lamps, protection against accidental contact with live parts of the lamp cap shall also be ensured.

There shall be, in addition, adequate protection against the risk of contact with basic insulation. Such insulation may, however, be accessible after removing a cover that requires the use of tools for removal and has to be removed for user maintenance, or after removing a cover that can be removed without tools if marked 'Remove plug before removing this cover' or Disconnect from the mains before removing this cover'.

The insulating properties of lacquer, enamel, ordinary paper, cotton, oxide film on metal parts, beads and sealing compound shall not be relied upon to give the required protection against accidental contact with live parts.

The enclosure of the appliance shall have no openings, other than those necessary for the use and working of the appliance, giving access to live parts and, for class II appliances, to parts separated from live parts by basic insulation only.

NOTE 1. Unless otherwise specified, parts operating at safety extra-low voltage not exceeding 24 V are not considered to be live parts.

NOTE 2. If a manufacturer instructs the user to remove a part during normal operation or user maintenance, that part is regarded as a detachable part even if a tool has to be used for its removal.

NOTE 3. This requirement excludes the use of screw-type fuses and screw-type miniature circuit-breakers if they are accessible without the aid of a tool.

NOTE 4. Self-hardening resins are not regarded as sealing compound.

TEST. Compliance shall be checked by inspection and by a test with test finger I specified in BS 3042 (see figure 1).

In addition all apertures in class II appliances, and apertures in class I appliances other than those in metal parts connected to an earthing terminal or earthing contact, and

those giving access to live parts in socket outlets and lamp caps, shall be tested with test pin I specified in BS 3042: (see figure 2, test finger and the test pin are applied, without appreciable force, in every possible position.

Appliances for wall-mounting and appliances for building-in shall be tested as delivered, except that reliance may be placed on the enclosure to provide protection against contact with basic insulation.

An appliance designed as a single appliance but delivered as a number of units shall be tested after assembly.

For appliances provided with movable devices, such as those intended for the tension of belts, the test shall be made with the devices adjusted to their most unfavourable position within their range of adjustment.

Apertures preventing the entry of the finger shall be further tested by means of a straight unjointed test finger of the same dimensions, which is applied with a force of 20 N; if this finger enters, the test with test finger I is repeated, the finger being introduced through the aperture. If the unjointed test finger does not enter, the force applied is increased to 30 N. If then the guard is so displaced or the aperture so distorted that test finger I can be inserted without force, the test with test finger I is repeated. An electrical contact indicator shall be used to show contact.

It shall not be possible to touch bare live parts or live parts protected by lacquer, enamel, ordinary paper, cotton, oxide film, beads or sealing compound only, with test finger I specified in BS 3042.

It shall not be possible to touch basic insulation with test finger I unless it is under a detachable cover which either requires the use of a tool for removal or is marked, 'Remove plug before removing this cover' or 'Disconnect from the mains' before removing this cover'.

For class II appliances it shall not be possible to touch bare live parts with the test pin I of BS 3042 or to touch metal parts separated from live parts by basic insulation only with test finger I specified in BS 3042.

NOTE 1. When applying test finger I, either or both of the jointed sections should be turned through any angle up to 90° with respect to the axis of the finger in the same direction only.

NOTE 2. It is recommended that a lamp be used for the indication of contact and that the voltage be not less than 40 V.

NOTE 3. The fact that appliances for wall-mounting and appliances for building-in are tested as delivered does not imply that such appliances must be completely enclosed; the basic insulation of wiring in appliances other than those of class II may give the required protection against electric shock, provided it is adequately protected or enclosed after installation of the appliance.

8.2 No requirement.

8.3 For appliances other than those of class III, flexible shafts that are handled in normal use shall be insulated from the motor shafts by suitable couplings of insulating material.

TEST. Compliance shall be checked by inspection and by the tests specified for supplementary insulation.

8.4 Conducting liquids that are or may become accessible in normal use shall not be in direct contact with live parts other than those operating at safety extra-low voltages not exceeding 24 V.

For class II appliances, such liquids shall not be in direct contact with basic insulation or with metal parts insulated from live parts by basic insulation only.

8.5 Shafts of operating knobs, handles, levers and the like shall not be live.

TEST. Compliance with the requirements of 8.4 and 8.5 shall be checked by inspection.

8.6 For appliances other than those of class III, handles, levers and knobs that are held or actuated in normal use shall not become live in the event of an insulation fault. If these handles, levers or knobs are of metal, and if their shafts or fixings are likely to become live in the event of an insulation fault, they shall either be adequately covered by insulating material or their accessible parts shall be separated from their shafts or fixings by supplementary insulation.

For stationary appliances, this requirement does not apply to handles, levers and knobs, other than those of electrical components, provided they are either reliably connected to an earthing terminal or earthing contact, or separated from live parts by earthed metal.

TEST. Compliance shall be checked by inspection and, if necessary, by the tests specified for supplementary insulation.

8.7 For appliances other than those of class III, handles which, in normal use, are continuously held in the hand, shall be so constructed that, when gripped as in normal use, contact between the operator's hand and metal parts that may become live in the event of an insulation fault is unlikely.

TEST. Compliance shall be checked by inspection and by manual test.

8.8 For class II appliances, capacitors shall not be connected to accessible metal parts, and their casings, if of metal, shall be separated from accessible metal parts by supplementary insulation.

TEST. Compliance shall be checked by inspection and by the tests specified for supplementary insulation.

8.9 Appliances intended to be connected to the supply by means of a plug shall be so designed that, in normal use, there is no risk of electric shock from charged capacitors when touching the pins of the plug.

TEST. Compliance shall be checked by the following test, which is carried out ten times.

The appliance is operated at rated voltage or at the upper limit of the rated voltage range.

The appliance switch, if any, is then moved to the 'off' position and the appliance is disconnected from the supply by means of the plug.

One second after disconnection, the voltage between the pins of the plug is measured with an instrument that does not appreciably affect the value to be measured.

This voltage shall not exceed 34 V.

NOTE. Capacitors having a rated capacitance not exceeding 0.1 μF are not considered to entail a risk of electric shock.

9. Starting of appliances

9.1 Motors shall start under all normal voltage conditions that may occur in use.

Centrifugal and other automatic starting switches shall operate reliably and without contact chattering.

Motors to be started by hand shall cause no danger if they are started in the wrong direction.

Kitchen machines shall start with the speed control set at the lowest position recommended in the manufacturer's instruction for any mode of operation and under conditions of normal load.

TEST. Compliance shall be checked by starting the appliance three times at a voltage equal to 0.85 times rated voltage.

the appliance being at room temperature at the beginning of the test.

The motor shall be started each time under the conditions occurring at the beginning of normal operation or, for automatic appliances, at the beginning of the normal cycle of operation, the motor being allowed to come to rest between successive starts.

For appliances provided with motors having other than centrifugal starting switches, this test shall be repeated at a voltage equal to 1.06 times rated voltage. Motors to be started by hand are started in the correct direction and, if possible, in the wrong direction.

In all cases, the appliance shall function in such a way that safety is not affected.

NOTE. The supply source is such that, during the test, the drop in voltage does not exceed 1%.

9.2 The starting current shall not blow a quick-acting fuse-link having a rated current:

- (a) according to the marking, if the rated current of the appropriate fuse-link is marked on the appliance;
- (b) equal to the rated current of the appliance, with a minimum of 10 A for appliances having a rated voltage exceeding 130 V, and 16 A for appliances having a rated voltage of 130 V and less, if the rated current of the appropriate fuse-link is not marked on the appliance.

NOTE. During the test specified in 9.1 and 9.2, care shall be taken that accidental stalling does not occur.

TEST. Compliance shall be checked by the following test.

The appliance is connected in series with a silver wire having a length of 85 mm and a diameter as shown in table 1.

Table 1. Diameter of silver wire for fuse test

Rated current of fuse	Diameter of silver wire	
	starting time not exceeding 1 s	starting time exceeding 1 s
A	mm	mm
10	0.29	0.39
16	0.39	0.52

The wire has a silver content not less than 99.9%, and it is stretched horizontally along the centre line of a box with inside dimensions of 80 mm x 80 mm x 150 mm.

The appliance is so loaded that the conditions for starting are the most unfavourable encountered in normal use.

The appliance is then started ten times at a voltage equal to 0.9 times rated voltage and ten times at a voltage equal to 1.1 times rated voltage. The interval between consecutive starts is made sufficiently long to prevent undue heating, and not less than 5 min.

During the test, the silver wire shall not melt and neither shall any overload protection device operate.

NOTE 1. The supply source is such that, during the test, the drop in voltage does not exceed 1%.

NOTE 2. A revision of this test is under consideration.

9.3 Overload protection devices shall not operate under normal starting conditions.

TEST. Compliance shall be checked during the test specified in 9.2.

10. Input and current

10.1 The input of the appliance at rated voltage and at normal operating temperature shall not deviate from the rated input by more than the deviation shown in table 2.

Table 2. Permissible variations in rated input

Rated input	Deviation
W	
Up to and including 33.3	+ 10 W*
Over 33.3 up to and including 150	+ 30 %*
Over 150 up to and including 300	+ 45 W*
Over 300	+ 15 %*

*The negative deviation is not limited.

NOTE. For appliances marked with a rated voltage range having limits differing by more than 10% of the mean value of the range, the permissible deviations apply for both limits of the range.

TEST. Compliance shall be checked by measuring the input of the appliance operated at rated voltage and under normal load, when the input has stabilized. If the load varies throughout the operating cycle, the input shall be measured by means of a watt-hour meter, and determined as the mean value of the input occurring during a representative period.

For appliances listed below, the test shall be carried out under the following conditions.

Minced shall be fed for 2 min with sinewless, boneless and fatless beef, cut into pieces having dimensions of approximately 2 mm x 20 mm x 60 mm. The pusher, if any, shall be pressed with a force of 5 N against the meat.

Noodle attachments shall be fed with a dough prepared from 300 g of flour, (wheat), 1 egg, (55 g), and 0.055 litre of water.

The pusher, if any, shall be pressed with a force of 5 N against the dough.

Berry juice extractors shall be fed with 1 kg of juice berries, such as currants, gooseberries, or grapes.

The pusher, if any, shall be pressed with a force of 5 N against the berries.

Knives shall be fed for three periods of 3 min with hard salami of about 5.5 cm in diameter, a rest of 1 min being allowed between each period. The knife shall be applied to the salami with a force of approximately 10 N.

For coffee grinders and coffee mills, the input shall be measured 10 s after the appliance has been switched on.

10.2 If the appliance is marked with rated current, the current taken by the appliance shall not exceed the rated current by more than 10%.

TEST. Compliance shall be checked by measuring the current taken by the appliance operating under normal load, rated voltage and rated frequency.

10.3 No requirement.

11. Heating

11.1 Appliances and their surroundings shall not attain excessive temperatures in normal use.

Multi-purpose appliances shall be tested with those

accessories within the appliance manufacturer's specification that give the most unfavourable results. TEST. Compliance shall be checked by determining the temperature rise of the various parts under the conditions specified in 11.2, 11.3, 11.5 and 11.7.

11.2 Hand-held appliances shall be suspended in their normal position, in still air. Stand-supported mixers shall be tested on their stand, using the bowl supplied with the mixer. When no bowl is supplied, the bowl for hand mixers shall be used.

Appliances for building-in shall be built in, dull black-painted plywood walls, about 20 mm thick, being used.

Other appliances shall be placed on, or fixed to, a support of dull black-painted plywood having a thickness of 20 mm, as follows.

- (a) Appliances normally used on a floor or a table shall be placed on a horizontal support.
- (b) Appliances normally fixed to a wall shall be mounted on a vertical support.

11.3 Temperature rises other than those of windings shall be determined by means of fine-wire thermocouples so chosen and positioned that they have the minimum effect on the temperature of the part under test.

Thermocouples used for determining the temperature rise of the surface of walls and floors shall be attached to the back of small blackened discs of copper or brass, 15 mm in diameter and 1 mm thick, which are flush with the surface.

As far as possible, the appliance shall be so positioned that parts likely to attain the highest temperatures touch the discs.

In determining the temperature rises of handles, knobs, grips and the like, consideration shall be given to all parts that are gripped in normal use and, if of insulating material, to parts in contact with hot metal.

The temperature rise of electrical insulation, other than that of windings, shall be determined on the surface of the insulation at places where failure could cause a short circuit; or contact between live parts and accessible metal parts; bridging of insulation or reduction of creepage distances or clearances below the values specified in 29.1.

Temperature rises of windings shall be determined by the resistance method unless the windings are non-uniform or it involves severe complications to make the necessary connections, in which case the temperature rise shall be determined by means of thermocouples.

NOTE 1. If it is necessary to dismantle the appliance to position thermocouples, the input is measured again to check that the appliance has been correctly reassembled.

NOTE 2. The point of separation of the cores of a multicore cable or cord and where insulated wires enter lampholders are examples of places where thermocouples are positioned.

11.4 No requirement.

11.5 Appliances shall be operated under normal load and at the most unfavourable voltage between 0.94 times the minimum rated voltage and 1.06 times the maximum rated voltage.

11.6 No requirement.

11.7 Appliances shall be operated for the time, the periods of operation and the speed settings specified for normal load in 2.30.

11.8 During the test, thermal cut-outs shall not operate; the temperature rises shall be monitored continuously and shall not exceed the values shown in table 3; and sealing compound, if any, shall not flow out.

For appliances tested in an ambient temperature of -4 °C, e.g. ice cream machines, the temperature rise figures shown in the table are increased by 30 °C.

The measurements specified in 13.1 shall be made at the end of this test.

Table 3. Permissible temperature rises

Part	Temperature rise	Part	Temperature rise
	°C or K		°C or K
Windings ¹ , if the winding insulation is:		phenol-formaldehyde with mineral fillers	100 (200)
of class A material ²	75 (65)	melamine-formaldehyde	75 (150)
of class E material ²	90 (80)	urea-formaldehyde	65 (150)
of class B material ²	95 (85)	polyester with glass-fibre reinforcement	110
of class F material ²	115	silicone rubber	145
of class H material ²	140	polytetrafluoroethylene	265
Pins of appliance inlets:		pure mica and tightly sintered ceramic material, when such materials are used as supplementary insulation or reinforced insulation	400
for very hot conditions	130	thermoplastic material ⁷	—
for hot conditions	95	Wood, in general, including wooden supports for test ⁸	65
for cold conditions	40	Outer surface of capacitors:	
Terminals, including earthing terminals, for external conductors of stationary appliances, unless they are provided with a power supply cord	60	with marking of maximum operating temperature (T)	7-35
Ambient of switches ³ :	30	without marking of maximum operating temperature:	
without T-marking or temperature rating	7-25	small ceramic capacitors for radio and television interference suppression	50
with T-marking or temperature rating		other capacitors	20
Rubber or polyvinyl chloride insulation of internal and external wiring including power supply cords:		External enclosure of appliances, except handles held in normal use	50
without T-marking or temperature rating	50 ⁴	Handles, knobs, grips and the like which, in normal use, are continuously held	
with T-marking or temperature rating	7-25 ⁵	of metal	30
Cord sheaths used as supplementary insulation	35	of porcelain or vitreous material	40
Rubber, other than synthetic, used for gaskets or other parts, the deterioration of which could affect safety:		of moulded material, rubber or wood	50
when used as supplementary insulation or as reinforced insulation	40	Handles, knobs, grips and the like which, in normal use, are held for short periods only (e.g. of switches):	
in other cases	50	of metal	35
Material used as insulation other than that specified for wires and windings ⁶ :		of porcelain or vitreous material	45
impregnated or varnished textile, paper or press board	70	of moulded material, rubber or wood	60
laminates bonded with:		Any point where the insulation of wires can come into contact with parts of a terminal block or compartment for fixed wiring of a stationary appliance not provided with a power supply cord:	
melamine-formaldehyde, phenol-formaldehyde or phenol-furfural resins	85 (175)	where the instructions require T-marked or temperature rated wires	7-25 ⁵
urea-formaldehyde resin	65 (150)	in other cases	50 ⁴
mouldings of:			
phenol-formaldehyde with cellulose fillers	85 (175)		

NOTES TO TABLE 3

¹ To allow for the fact that the temperature of windings of universal motors, relays, solenoids, etc. is usually below the average at the points where thermocouples are placed, the figures without parentheses apply when the resistance method is used and those within parentheses apply when thermocouples are used. For windings of vibrator coils and a.c. motors, the figures without parentheses apply in both cases.

² The classification is in accordance with the requirements of BS 2757.

Examples of class A material are:

impregnated cotton, silk, artificial silk and paper;
enamels based on oleo- or polyamide resins.

Examples of class B material are:

asbestos, glass fibre, melamine-formaldehyde and phenol-formaldehyde resins.

Examples of class E material are:

mouldings with cellulose fillers, cotton fabric laminates and paper laminates bonded with melamine-formaldehyde, phenol-formaldehyde or phenol-furfural resins;
cross-linked polyester resins, cellulose triacetate films, polyethylene terephthalate films;
varnished polyethylene terephthalate textile bonded with oil-modified alkyd resin varnish;

enamels based on polyvinylformal, polyurethane or epoxy resins.

For totally enclosed motors the temperature rise limits for class A, class E and class B may be increased by 5 °C (5 K).

A totally enclosed motor is a motor so constructed that the circulation of the air between the inside and the outside of the case is prevented but it is not necessarily sufficiently enclosed to be called airtight.

³ T signifies the maximum operating temperature.

For the purpose of this test, switches and thermostats marked with individual ratings may be considered as having no marking for the maximum operating temperature, if requested by the appliance manufacturer.

⁴ This limit applies to cables, cords and wires complying with the requirements of BS 6500.

⁵ This limit will become applicable as soon as there are British Standards for high temperature cables, cords and wires.

⁶ The values in parentheses apply if the material is used for handles, knobs, grips and the like and it is in contact with hot metal.

⁷ There is no specific limit for thermoplastic material which has to withstand the tests specified in 30.1 or 30.2, for which purpose the temperature rise must be determined.

⁸ The limit specified concerns the deterioration of wood and it does not take into account deterioration of surface finishes.

The temperature rise limits in the table may be exceeded if it can be shown that the temperatures are not in excess of the thermal capabilities of the materials as determined by ageing tests made on the materials themselves. Other materials not listed in the table may be used under the same conditions.

The values in the table are based on an ambient temperature not normally exceeding 25 °C but occasionally reaching 35 °C. However, the temperature rise values specified are based on 25 °C.

The value of the temperature rise of a copper winding shall be calculated from the formula:

$$\Delta t = \frac{R_2 \cdot R_1}{R_1} (234.5 + t_1) - (t_2 - t_1)$$

where

- Δt is the temperature rise (in °C or K)
- R_1 is the resistance at the beginning of the test (in Ω)
- R_2 is the resistance at the end of the test (in Ω)
- t_1 is the room temperature at the beginning of the test (in °C)
- t_2 is the room temperature at the end of the test (in °C)

At the beginning of the test, the windings shall be at room temperature.

It is recommended that the resistance of windings at the end of the test be determined by taking resistance measurements as soon as possible after switching off, and then at short intervals so that a curve of resistance against time can be plotted for ascertaining the resistance at the instant of switching off.

NOTE. The classification of handles, knobs, grips and the like according to their materials is derived from the constant:

$$b = \sqrt{\lambda c \gamma}$$

where

- λ is the thermal conductivity of the material (in W/(m K))
- c is the specific heat of the material (in J/(kg K))
- γ is the specific mass of the material (in kg/m³)

The materials are classified as follows:

- value of b greater than 3500 metal;
- value of b between 1000 and 3500 porcelain or vitreous material;
- value of b less than 1000 moulded material, rubber or wood.

An alternative method of determining the constant, b , is as follows.

Samples of materials with known values of the constant, b , and a sample of the material to be classified, all samples having the same dimensions, are fixed to a heated metal plate.

The temperatures of the upper surfaces of the various samples are measured and the temperatures of the reference samples are plotted as a function of the constant, b .

The constant, b , of the material to be classified is derived from this curve by reading off the value, b , corresponding to the temperature attained by the sample under investigation.

11.9 No requirement.

12. No requirement.

13. Electrical insulation and leakage current at operating temperature

13.1 The electrical insulation of the appliance at operating temperature shall be adequate and the leakage current in normal use shall not be excessive.

TEST. Compliance shall be checked by the test specified in 13.2, the appliance being operated under normal load for the time specified in 11.7.

Appliances shall be operated at a supply voltage equal to 1.06 times the rated voltage.

The tests shall be carried out while the appliance is connected to the supply.

13.2 The leakage current shall be measured between any pole of the supply and:

- (a) accessible metal parts and metal foil with an area not exceeding 200 mm x 100 mm in contact with accessible surfaces of insulating material, connected together;
- (b) metal parts of class II appliances separated from live parts by basic insulation only.

The measuring circuit shall be as shown in the following figures:

- (a) If of class II, figure 4;
- (b) if other than class II, figure 5.

The resistance of the measuring circuit shall be $2000 \pm 100 \Omega$ and, if it is suspected that high-frequency currents are being generated, the measuring instrument shall have an accuracy of at least 5 % for all frequencies within the range of 20 Hz to 5000 Hz, but it shall be insensitive to higher frequencies.

The test shall be carried out with a.c., unless the appliance is for d.c. only, in which case the test shall not be made.

The leakage current shall be measured with the selector switch, shown in figures 4 and 5, in each of the positions 1 and 2.

After an operating time as specified in 11.7, the leakage current shall not exceed the following values:

(a) to accessible metal parts and metal foil:

- (1) for portable class I appliances 0.75 mA
- (2) for stationary class I appliances 3.5 mA
- (3) for class II appliances 0.25 mA
- (4) for class III appliances 0.5 mA

(b) to metal parts of class II appliances separated from live parts by basic insulation only, if the appliance is classified according to degree of protection against moisture as:

- (1) ordinary appliance 5.0 mA
- (2) other than ordinary appliance 3.5 mA

If the appliance incorporates one or more capacitors and is provided with a single-pole switch, the measurements shall be repeated with the switch in the 'off' position.

NOTE 1. The cut-off frequency of 5000 Hz may, for example, be obtained by connecting a capacitor of 150 ± 7.5 nF in parallel with the resistive components of the measuring circuit. The measuring circuit may be partly or completely incorporated in the measuring instrument. If an instrument of the rectifier type is used, it should rectify linearly from 0.2 mA upwards within the frequency range of 20 Hz to 10 000 Hz, and should be calibrated in r.m.s. values with a current of substantially sine-wave form. If high-frequency voltages are not present, the cut-off frequency of the measuring instrument may exceed 5000 Hz.

NOTE 2. It is recommended that the appliance be supplied through an isolating transformer; otherwise, it should be insulated from earth.

NOTE 3. The metal foil has the largest area possible on the surface under test, without exceeding the dimensions specified. If its area is smaller than the surface under test, it is moved so as to test all parts of the surface; the heat dissipation of the appliance should not, however, be affected by the metal foil.

NOTE 4. The test with the switch in the 'off' position is made to verify that capacitors connected behind a single-pole switch do not cause an excessive leakage current.

13.3 No requirement.

14. Radio and television interference suppression

The incorporation of components necessary to achieve an adequate degree of radio and television interference

suppression shall not adversely affect the safety of the appliance.

TEST. Compliance shall be checked by the tests specified in this standard.

NOTE. Attention is drawn to the fact that compliance with the requirements concerning the limits for interference effects generated by the appliance, as specified in BS 800, and when measured in accordance with that standard, will in most cases ensure that the appliance has the required degree of radio and television interference suppression.

15. Moisture resistance

15.1 The enclosure of drip-proof, splash-proof and watertight appliances shall provide the degree of protection against moisture in accordance with the classification of the appliance.

TEST. Compliance shall be checked by the appropriate treatment specified in 15.2.

Immediately after the appropriate treatment for drip-proof and splash-proof appliances, the appliance shall withstand the electric strength test specified in 16.4, and inspection shall show that water that may have entered the appliance does not impair compliance with the requirements of this standard; in particular, there shall be no trace of water on insulation for which creepage distances are specified in 29.1.

Appliances that are not subject to spillage of liquid in normal use shall be allowed to stand in normal test-room atmosphere for 24 h before being subjected to the test specified in 15.4.

15.2 Appliances provided with an appliance inlet shall be fitted with an appropriate connector and flexible cable or cord; appliances with type X attachments shall be fitted with the lightest permissible type of flexible cable or cord of the smallest cross-sectional area specified in 26.2; and other appliances shall be tested as delivered.

Electrical components, covers and other parts that can be removed without the aid of a tool shall be removed and subjected, if necessary, to the relevant treatment with the main part.

Sealing rings of glands and other sealing means, if any, shall be aged in an atmosphere having the composition and pressure of the ambient air by suspending them freely in a heating cabinet ventilated by natural circulation.

They shall be kept in the cabinet at a temperature of 70 ± 2 °C, for 10 days (240 h).

Immediately afterwards, the samples shall be taken out of the cabinet and left at room temperature, avoiding direct daylight, for at least 16 h before being reassembled. The glands and other sealing means shall then be tightened with a torque equal to two-thirds of that applied during the test specified in 21.3.

NOTE. The use of an electrically-heated cabinet is recommended. Natural circulation may be provided by holes in the walls of the cabinet.

Drip-proof appliances shall then be subjected for 5 min to the vertical rain test.

Splash-proof appliances shall then be:

- (a) if hand-held, subjected for 5 min to the vertical rain test, the appliance being turned continuously through the most unfavourable positions;
- (b) if neither hand-held nor normally fixed to a ceiling, subjected for 10 min to the oblique rain test, followed by 5 min subjection to the splash test.

Watertight appliances shall then be subjected for 24 h to the immersion test.

For the vertical rain test, an apparatus similar to that shown in figure 9 which delivers 3 mm of rain per minute, uniformly distributed over the sample, shall be used.

Appliances normally fixed to a wall or a ceiling shall be fixed in the normal position of use, to a wooden board, if necessary, this board having dimensions that are equal to those of the surface of the appliance in contact with the wall.

The wooden board itself shall be supported so that the nozzles of the rain apparatus are 2 m above the uppermost point of the appliance, for appliances normally fixed to a wall, or above the surface to which the appliance is fixed, for appliances normally fixed to a ceiling.

Other appliances, except hand-held appliances, shall be placed in the normal position of use, so that the nozzles of the rain apparatus are 2 m above the uppermost point of the appliance.

For the oblique rain test, the spray apparatus shown in figure 11 shall be used, the apparatus comprising a tube formed into a semicircle. The radius of the circle is 200 mm or a multiple of 200 mm and is as small as is compatible with the size and position of the sample. The tube is perforated so that jets of water are directed towards the centre of the circle, and the water pressure at the inlet to the apparatus is equivalent to a head of about 10 m.

The tube is caused to oscillate through an angle of 120° , 60° on each side of the vertical, the time for one complete oscillation ($2 \times 120^\circ$) being about 4 s.

Appliances normally fixed to a wall shall be mounted as in normal use on a wooden board having dimensions that are 150 ± 50 mm in excess of those of the orthogonal projection of the appliance on the board.

Other appliances shall be placed on a support having dimensions that are at least 50 mm in excess of those of the orthogonal projection of the appliance on the support.

The sample shall be mounted or placed at the centre of the semicircle formed by the tube so that its lowest part is level with the axis of oscillation. The sample shall be turned about its vertical axis during the test.

For the splash test, the apparatus shown in figure 10 shall be used. During the test, the water pressure shall be regulated so that the water splashes up 150 mm above the bottom of the bowl. The bowl shall be placed on the floor for appliances normally used on the floor and, for all other appliances, on a horizontal support 50 mm below the lowest edge of the appliance; the bowl shall be moved around so as to splash the appliance from all directions. Care shall be taken to ensure that the appliance is not hit by the direct jet.

Appliances normally used on a working surface other than the floor shall be placed on a supporting surface that has dimensions equal to the surface of the appliance in contact with the support.

NOTE. A revision of the splash test is under consideration.

For the immersion test, the appliance shall be immersed in water at a temperature of $20 \pm 5^\circ\text{C}$ and containing approximately 1 % NaCl, the top of the appliance being about 50 mm below the water level, except that appliances marked with maximum depth of immersion shall be immersed in accordance with this marking.

Plugs, if any, shall be kept dry and the appliances shall be operated in accordance with conditions of adequate heat discharge and/or under normal load.